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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/615,794	07/10/2003	Panayotis Andricacos	20140-00302-US /YOR920030	3511
30678	7590	09/13/2005	EXAMINER	
CONNOLLY BOVE LODGE & HUTZ LLP SUITE 800 1990 M STREET NW WASHINGTON, DC 20036-3425			BIRENBAUM, NIRA S	
			ART UNIT	PAPER NUMBER
			1742	

DATE MAILED: 09/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/615,794

Applicant(s)

ANDRICACOS ET AL.

Examiner

Nira S. Birenbaum, Ph.D.

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 8-12-2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-14 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-14 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

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## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-5 and 9 are rejected under 35 U.S.C. 102(e) as being anticipated by Seita *et al.* (US Patent No. 6,881,319).

Regarding claim 1, Seita *et al.* teach a method for controlling the composition of a copper plating bath comprising:

- providing plating bath and obtaining an aliquot, *i.e.*, a bath liquor (column 3, lines 14-30 and column 4, lines 64-67)
- determining the concentration of an accelerator byproduct, referred to as –X–S– (column 4, lines 60-64). This is equivalent to the claimed “void formation marker” as defined in applicant’s specification.
- maintaining the VFM concentration below a certain threshold level (column 5, lines 56-67).

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Regarding claim 2, Seita *et al.* teach that determining the concentration comprises separating the VFM from the solution and quantifying it (column 4, lines 60-64). Although these steps are not expressly recited, they are inherent to the process of measuring a concentration by high speed liquid chromatography.

Regarding claims 3-5, Seita *et al.* teach that the VFM is separated by high speed liquid chromatography (column 4, lines 60-64). This technique is synonymous with high performance liquid chromatography (HPLC).

Regarding claim 9, HPLC would inherently provide a quantitative output in proportion to the concentration of VFM. Specifically, HPLC provides a chromatogram consisting of a series of peaks corresponding to different analytes. The area under a peak is integrated to obtain the concentration of the analyte.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Seita *et al.* in view of Skoog *et al.* (*Fundamentals of Analytical Chemistry* 7<sup>th</sup> Ed.; Saunders College Publishing, Fort Worth, 1996, pp. 701-703 and 708-709).

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Seita *et al.* teach the features as previously described. However, this reference does not teach that the method of chromatography is ion-pairing, reversed-phase chromatography. Skoog *et al.* teach that reversed phase liquid chromatography is a subset of high performance liquid chromatography (see Figure 30-2 and pp 708-709). Furthermore, the term "ion pairing" refers to the solvent system used in the HPLC and thus is merely describing the chromatography conditions. It would have been obvious to one of ordinary skill in the art at the time of the invention to select reversed phase chromatography from the broader category of HPLC taught by Seita *et al.*, because Skoog *et al.* teach that the eluent for this technique are aqueous solutions, which is advantageous to using pure organic solvents (pg 709).

Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Seita *et al.* in view of Talasek *et al.* (US 2004/0108213).

Seita *et al.* teach the features previously described. However, this reference does not teach that the quantifying is performed by spectroscopy or electrochemical deposition.

Talasek *et al.* teach a method for controlling the composition of a plating bath wherein the amount of additive breakdown byproduct is measured by optical or electrochemical techniques (paragraph 29 and paragraph 38). Regarding claim 8, an optical technique would comprise ultraviolet, visible, and infrared spectroscopy.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Seita *et al.* by using optical or electrochemical techniques to quantify the VFM concentration as disclosed by Talasek *et al.*, because

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Talasek teaches that these methods allow direct real-time detection of byproducts (paragraph 49).

Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chalyt *et al.* (US Patent No. 6,749,739) in view of Blachier *et al.* (US Patent No. 6,749,739).

Regarding claim 10, Chalyt *et al.* teach a method for detecting the breakdown of plating bath additives comprising periodically determining a ratio of suppressor breakdown product to suppressor concentration, and correlating this parameter with the deposit quality in order to define an acceptable concentration range for the breakdown product (column 7, lines 36-42). Note that the step of plating a substrate is inherent to this process.

However, this reference does not teach counting the number of voids and setting the acceptable range (or threshold value) for the byproduct concentration according to the number of voids.

Blachier *et al.* teach a method for plating objects wherein certain aspects of the plating process are monitored in order to maintain the byproduct concentration below a predetermined value. In one embodiment, the degree of void-free plating is measured, which is equivalent to counting the number of voids (column 7, lines 49-61). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Chalyt *et al.* by counting the number of voids as taught by Blachier *et al.*, and using this value to determine the threshold value, because Blachier *et al.* teach that

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monitoring this aspect provides an indication of the condition of the plating substances (column 7, lines 62-64).

Regarding claim 11, Chalyt *et al.* do not teach that the VFM ratio is the concentration of a void-formation marker (accelerator breakdown product) divided by the concentration of the accelerator.

However, it would have been obvious to one of ordinary skill in the art to measure the ratio of accelerator breakdown product to accelerator concentration (instead of the ratio of suppressor breakdown product to suppressor concentration as taught by Chalyt *et al.*), because Blachier *et al.* teach that the accelerators tend to break down fast than the suppressors (column 1, lines 55-57).

Claims 12-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Seita *et al.* in view of Kopp (US Patent No. 6,083,374).

Seita *et al.* teach a method for maintaining a bath comprising determining a bath threshold level (column 5, lines 56-67) and determining the concentration of VFM (column 4, lines 60-64).

However, this reference does not teach performing a bleed and feed to maintain the VFM concentration below the threshold value.

Kopp teaches a method for maintaining a constant concentration of plating bath components wherein a portion of the plating bath is periodically removed and replenished with fresh solution (see abstract). The volume of solution removed is equal to the volume added (column 3, lines 46-51). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Seita *et al.* by

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incorporating a bleed and feed step as taught by Kopp, because Kopp teaches that removal of the solution containing decomposition products leads to an extension in the serviceable life of the bath (column 3, lines 25-35).

Regarding claim 14, it would have been obvious to one of ordinary skill in the art at the time of the invention to optimize the fractional volume of the bath which is replaced, because Kopp teaches that the quantity of solution replaced should be adapted to the specific plating parameters (column 3, lines 36-45).

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nira S. Birenbaum, Ph.D. whose telephone number is (571) 272-8516. The examiner can normally be reached on M-F 8:00 am - 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King can be reached on (571) 272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
**ROY KING**  
**SUPERVISORY PATENT EXAMINER**  
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